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A Recent Discovery of Hybrid Oaks on Staten Island.

BY ARTHUR HOLLICK.

Plates LXXXIII-LXXXV.

One day during the past summer Mr. Wm. T. Davis, of Tompkinsville, Staten Island, brought to me some leaves of an oak tree which he had found growing in the neighborhood of Tottenville, Staten Island, N. Y. To my surprise and delight I recognized them as belonging to *Quercus heterophylla*, Michx.—the celebrated “Bartram Oak.” On September 2d we visited the locality and found not only typical *Q. heterophylla*, but also a number of other peculiar forms, evidently hybrids, and including *Q. Rudkini*, Britton. On September 22d the trees were again visited; a careful study was made of them and their surroundings and a fine series of leaves and fruit collected. Probably no better opportunities for observation or finer specimens for study and comparison have ever been obtained, and the results have proved to be highly interesting. Two recognized species are added to the local flora of Staten Island and to the flora of New York State, and the northern range of *Q. heterophylla* is extended about thirty miles from its nearest previously-reported station. Considerable new light is also shed upon the question of the proper status of this latter form, in the botanical world, whether as a species, a variety or a hybrid, and, if the latter, what species are the probable parents.

The limits of this paper forbid an extensive review of the literature concerning these two interesting oaks, but for the benefit of all who may wish to study the subject I would refer to the account of *Q. Rudkini*, by Dr. N. L. Britton, in Vol. IX. No. 2, of the BULLETIN, and for *Q. heterophylla* to Mr. I. C. Martindale's “Notes on the Bartram Oak,” read before the West New Jersey Surveyors' Association, Jan. 6, 1880, and subsequently published in pamphlet form by the author. As, however, everyone may

not have access to these documents, I have thought that the following brief account of this latter oak—its history and the controversy regarding it—might not be out of place :

Some time during the early part of the last century a peculiar oak tree attracted the attention of botanists and others. It was a single individual, growing on the farm of Mr. John Bartram, on the banks of the Schuylkill, just above Philadelphia. From its location it received the name "Bartram Oak." It was also called "Burriers Oak," though why this latter name I have never been able to obtain the slightest clue. Just when the tree was first observed there does not appear to be any record, but it must have been prior to the year 1750, for on page 183 of Darlington's "Memorials of Bartram and Marshall" there is printed a copy of a letter which was written by Peter Collinson to John Bartram, from which I extract as follows :

Mch. 5th, 1750-1.

MY GOOD FRIEND JOHN :

Pray what is the reason I have no acorns from that particular species of oak that Dr. Mitchell found in thy meadow? And I observe, in thy specimens, two other narrow leaved oaks. As I have now ground enough I wish for a dozen good acorns of each. * * * *

Thine,

P. COLLINSON.

This is, I believe, the earliest reference in literature to this oak. No scientific name was given to it nor was it even mentioned in Humphrey Marshall's "Arbustrum Americanum," published in 1785. Andreas Michaux's "Flora Boreali-Americana," published in 1803 and reprinted in 1820, does not enumerate it among the oaks, although it is evident that he must have been aware of its existence, as his son, F. André Michaux, says in his "Histoire des Arbres Forestiers de l' Amerique Septentrionale," published in French in 1810 and republished in English in 1819: (See Vol. 1, p. 75, 76; plate 18.) "BARTRAM OAK. *Quercus heterophylla*. Every botanist who has visited different regions of the globe must have remarked certain species of vegetables which are so little multiplied that they seem likely at no distant period to disappear from the earth. To this class belongs the Bartram Oak. Several English and American naturalists, who, like my father and myself, have spent years in exploring the United States, and who have obligingly communicated to us the result of their observations, have, like us, found no traces of this species except

a single stock in a field belonging to Mr. Bartram on the banks of the Schuylkill, 4 miles from Philadelphia. This is a flourishing tree, 30 feet in height and 12 inches in diameter; and seems formed to attain a much greater development. * * * * I was at first disposed to consider this tree as a variety of the laurel oak, to which it bears the greatest affinity; but the leaves of that species are never indented, and not a stock of it exists within a hundred miles of Philadelphia."

This is no doubt the first published description and representation of this oak, and the very appropriate specific name given to it at that time by Michaux has fortunately not been subjected to any change by later botanists, so that there is no tangled skein of synonymy to unravel, and the specific title, *heterophylla*, "various leaved," will always serve it as its name, no matter whether it be classed as a variety, a species, or a hybrid. From the time of Michaux's description until about the year 1850 no other trees seem to have been found, and the only ones known were the original and a few seedlings from it. In fact, when the original tree was cut down, about the year 1840, it was thought that the species, if such it was, was exterminated. So that for a period of a hundred years the only material for study was from a single tree and its immediate progeny. This, however, did not prevent the botanists of that time from recording opinions in regard to it. Michaux, as before stated, gave to it a specific rank. Pursh said: "* * It is probably only a hybrid plant." * * Nuttall asked: "May not this be an anomalous variety of *coccinea*?" Torrey states unequivocally: "A hybrid." Gray, in his Manual published in 1848, says: "* * * doubtless a hybrid between *Q. Phellos* and *Q. falcata*, or some other species of that section." In the second edition of the Manual, published in 1856, he changes his opinion, and says: "* * * apparently a hybrid between *Q. Phellos* and *Q. tinctoria*?" In the fifth edition, published in 1867, he quotes De Candolle as referring it to a variety of *Q. aquatica*, and then says: "It is as likely to be a variety of *Q. Phellos*, with dilated and toothed or cut leaves." About the year 1855, however, some trees were discovered at Mt. Holly, N. J., (*Fide* specimen in Herb. Columbia College, marked "Mt. Holly, N. J., Aug. 25, 1855, W. Proctor,") and others

were subsequently found at stations in New Jersey and Delaware by Messrs. Smith, Leidy, Burk, Martindale, Meehan, Austin, Canby, Commons and others, which have been the subjects of numerous papers, notes and discussions. Even in the light of this new material, however, I find that there is as much difference of opinion as ever. Englemann first considered it as a good species and subsequently decided that it was hybrid with probably *Q. Phellos* and *Q. coccinea* for parents. Leidy considered it a hybrid between *Q. Phellos* and *Q. palustris*. S. B. Buckley says, in describing the tree at Mt. Holly: "It is * * * in a thicket near several willow oaks (*Quercus phellos*), of which it is plainly one." Cope and Smith rather lean to the opinion that it is a variety of *Q. Phellos*. A number of other botanists might be quoted as naming *imbricaria*, *nigra* and other species from which it may have been derived, but in nearly every instance *Q. Phellos* is mentioned as being connected with it in some way. Trees have also been reported from the District of Columbia, Maryland, North Carolina and Texas, but I have not seen specimens from any of these localities and the published descriptions of them are rather vague and indefinite. If all the localities where *Q. heterophylla* has been found, between Newcastle County, Del., and Staten Island, N. Y., were marked upon a map, they would be included in a straight narrow strip of country about ten or twelve miles in width; and this limited belt would probably include nearly every specimen of this tree now definitely known to be in existence.

The Staten Island station, is, like all the others, on the Cretaceous formation. The situation is a low piece of wet, sandy woodland, about a quarter of a mile from the beach. This piece of woodland is several acres in extent and its most conspicuous trees are *Castanea*, *Pinus rigida*, *Quercus alba*, *Q. rubra*, *Q. stellata*, *Q. nigra*, *Q. coccinea*, *Q. tinctoria*, *Q. palustris*, and *Q. Phellos*, but the hybrids are confined to a very limited area, not more than half an acre in extent and entirely within the very restricted territory where *Q. Phellos* occurs*. The immediate neighbors in this group at the present time are *Q. palustris*, *Q. nigra*, *Q. tinctoria* and *Q. coccinea*. A careful count was made of all trees

* In this connection it is a matter of interest to know that *Q. Phellos* does not grow in any other part of Staten Island.

which were considered hybrids, and an enumeration of twenty was the result. Three of these were *Q. Rudkini* and the others either typical *Q. heterophylla* or else members of the same series, showing *Q. Phellos* to be undoubtedly at one extreme and some one of the broad, lobed-leaved species at the other. Not more than fifteen trees of *Q. Phellos* were noted. The trees of *Q. Rudkini* are mostly low, with dark green coriaceous foliage, showing their relationship to *Q. nigra*. These, however, need not concern us, as I consider their proper status and relationship to be definitely settled, so that in what follows I shall confine myself to a discussion of the forms which include *Q. heterophylla*. These are evidently designed to be large, the tallest one being about 50 feet in height and 3 feet 8 inches in circumference, and having the appearance of a young and vigorous growing tree. The leaf and fruit of this tree are shown at fig. 1, plate LXXXV. As a rule the largest trees are those having the leaves most cut or lobed and the largest acorns, while the smaller trees approach nearer to the *Phellos* type. The leaves upon each tree, however, vary a great deal, although there is generally enough of some one prevailing form to give to each a decided individuality, and if they could be arranged side by side according to leaf form a graduated series would be the result, showing an almost imperceptible change from member to member.

The petioles are of medium length, varying from $\frac{3}{4}$ in. in the large, deeply lobed leaves, to $\frac{1}{4}$ in. in the entire leaved forms. The margins are either entire, wavy, lobed on one or both sides, or sinuate toothed with the teeth bristle pointed. In some there are bristles on the margin where a tooth or lobe is merely indicated by a slight inequality. As a rule they are rather thin, green both sides, somewhat tomentose along the midrib or at the junction of the midrib and main veins. In others the texture is somewhat coriaceous—approaching forms of *Q. Rudkini*. Fig. 3, Plate LXXXIV. represents an anomalous form, with thin, sparingly lobed leaves, covered over the entire under surface with a close light brown tomentum. The acorn is globose, flattened and with a deeper cup than the others. The general habit of the tree is slender and willow like, and it hardly appears to be a member of the series.

The venation is also a character which shows the transition between the simply pinnate veining of *Phellos* and the more complex branching of the broad, lobed forms. The acorns vary in shape from ovoid to almost globose, and, in size, from those of *Phellos* to others almost an inch in length by $\frac{3}{4}$ in. in diameter at the largest part. The cups are invariably saucer shaped, with closely appressed scales.

I made a special journey late in the season, to ascertain, if possible, whether anything could be learned from the autumnal coloring of the leaves, but I found them to be a uniform light yellow, turning brown.

From these observed facts I have finally come to the conclusion that we must consider *Q. heterophylla* to be a hybrid, and further, that one of the parents is *Q. Phellos*. They are invariably associated together, or at least the former has never been found except in the immediate vicinity of the latter; and, added to this, we know that *Q. Phellos* does produce a hybrid with *Q. nigra* and that this hybrid occurs associated with *Q. heterophylla*. It would not, in fact, be a matter of surprise to me if we should eventually find that other hybrid forms have resulted from the influence of *Q. Phellos* over other species of the black oak group. As to the other probable parent of *Q. heterophylla* there is yet room for careful research, although I think that the discovery of these trees on Staten Island has considerably simplified the matter. The species mentioned by those who have written upon the subject are *aquatica*, *imbricaria*, *falcata*, *coccinea*, *tinctoria* and *palustris*. The first three may be thrown out of the calculation at once on account of their geographical range—not a single specimen of either having ever been found or reported within miles of our station. *Coccinea* and *tinctoria*, while showing a leaf form that is satisfactory, have acorns with deep cups, entirely distinct from those of *heterophylla*. *Palustris* has a cup of the required form, but the acorn is far too small, and the lobes of the leaves have a distinctive divergent characteristic which those of *heterophylla* have not. The only other probable species, and it is the only one which does not seem to have been considered by our botanists, is *rubra*. Why this species has not received the attention it deserves in this connection I am at a loss

to understand, as both the leaf and acorn are eminently fitted to terminate one extreme of the series of which *Phellos* is the other, as I have endeavored to show in the accompanying plates. The only cause for hesitation which I have in accepting this as a satisfactory conclusion is that I failed to find trees of *rubra* growing in the immediate vicinity, although there are a number of them only a few hundred yards away. We should however remember that this species may have been present, associated with *Phellos*, years since, at the time when the existing large specimens of *heterophylla* were produced, probably 50 or 75 years ago. It may be that hybridization has not taken place in many years and that the young trees are merely seedlings from a few originals. This idea is strengthened in my mind from the fact that the largest and oldest trees come nearest to the type of *rubra*, while the smallest or youngest trees show a preponderance of the *Phellos* type—apparently showing a tendency to revert back to it. Dr. N. L. Britton has also pointed out to me a significant fact in this connection, viz.: that throughout the region where *heterophylla* has been found *Phellos*, *rubra*, and other members of the black oak group occur, but that to the eastward, in the Pine Barren region, *heterophylla* or *rubra* are not reported, although *Phellos* is abundant and *palustris* and other black oaks are present. In fact *heterophylla* only seems to occur where *Phellos* and *rubra* occupy a territory in common.

Algæ from Atlantic City, N. J.

COLLECTED BY S. R. MORSE.

The following species were collected at various times during the years 1884 to 1888 inclusive, and the specimens sent to me for examination; also in May, 1885, Mr. Morse and myself spent a few days together collecting. While this is certainly not a complete list of the algæ of Atlantic City, it contains quite a large number for a locality having no rocky shore whatever, but an open sandy beach in front, and muddy creeks and marshes in the rear.

Glæocapsa crepidinum, Thuret. Common on woodwork.

Entophysalis granulosa, Kütz. On shells, etc. Not previously reported on the American coast.

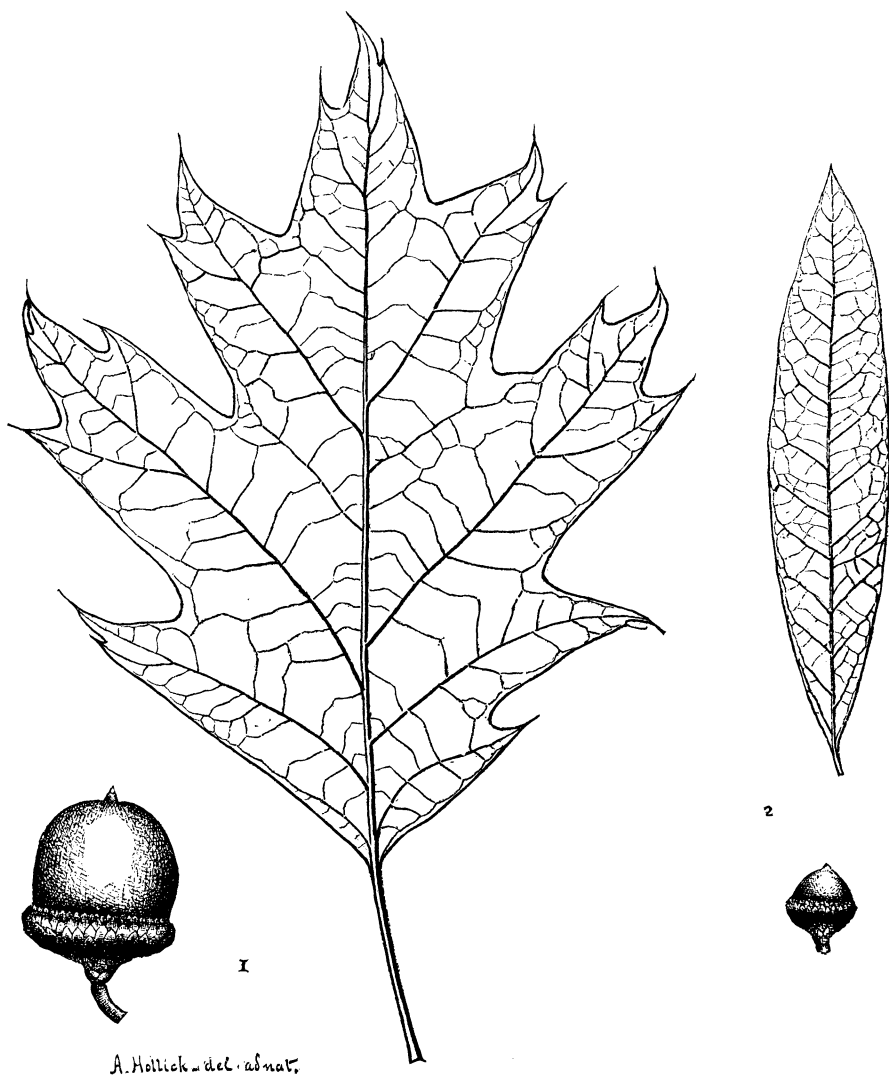
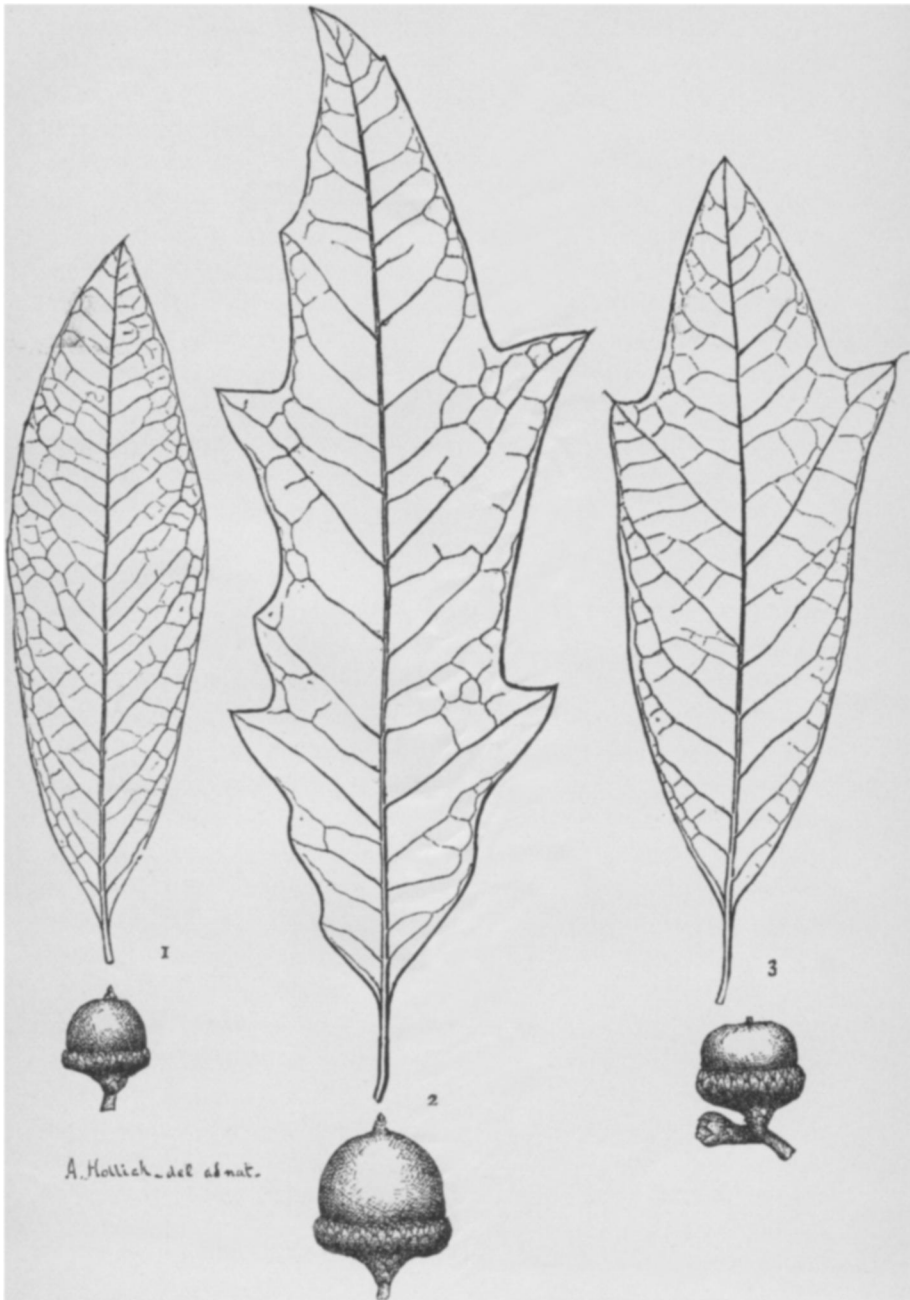
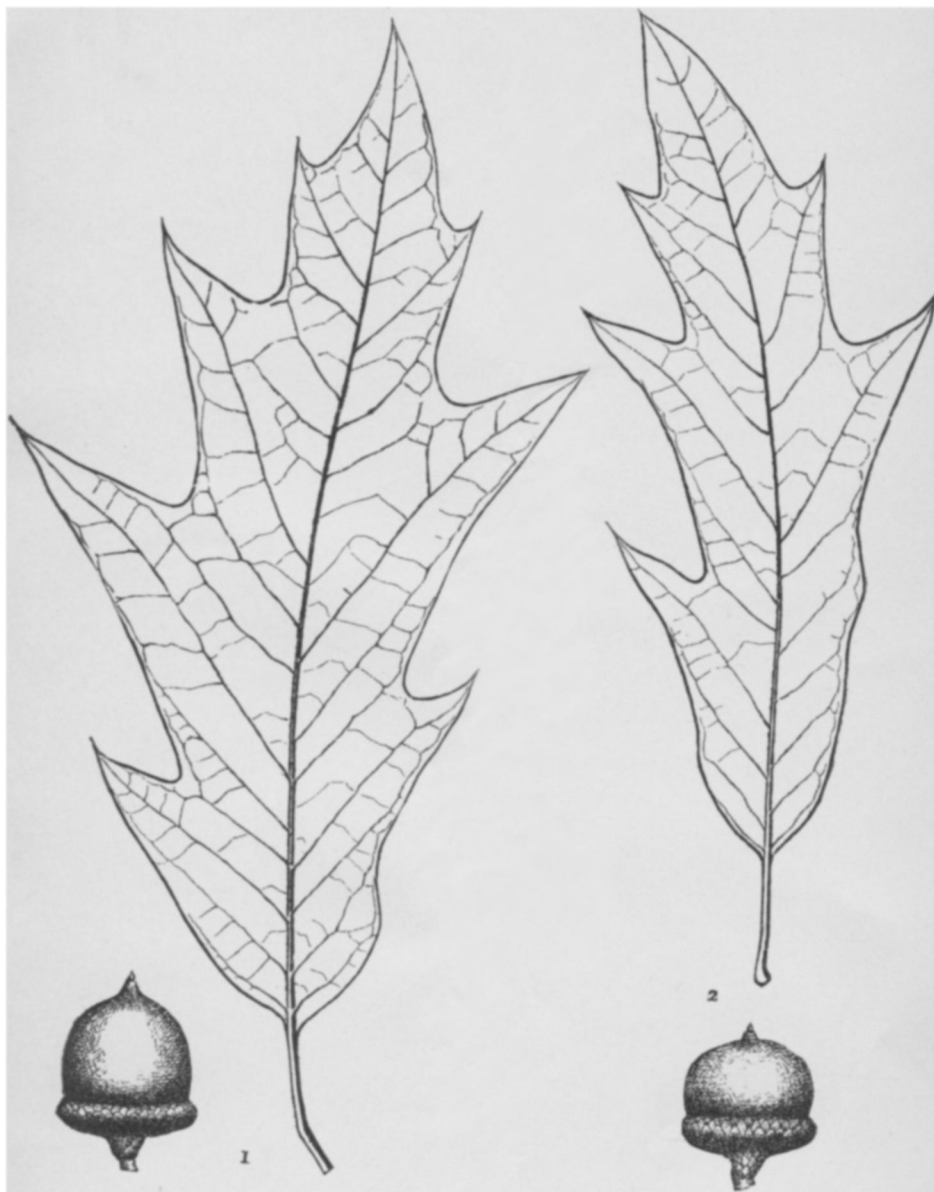


Fig. 1. *Quercus rubra*, L.

Fig. 2. *Quercus Phellos*, L.



Quercus heterophylla, Michx.



Quercus heterophylla, Michx.